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ABSTRACT

Reported are background information and initial analyses of Tennessee's Project STAR, a legislatively authorized study of class size. The aim of the project was to identify causes and effects of differences in elementary school class size. Primary analyses were conducted on kindergarten data for 1985-1986. During that year, 42 school districts and 79 individual schools participated in the project. Core variables were three classroom conditions: (1) small class, defined as one teacher with about 15 students; (2) regular class, defined as one teacher with about 26 students; and (3) regular class with a teacher aide. These three classroom conditions were investigated: (1) in inner-city, suburban, urban or small city, and rural locations; (2) in relation to pupil variables (race, sex, socioeconomic status); and (3) in relation to either achievement measures (mathematics, sounds and letters, words and sentences, total reading scores) or noncognitive measures (motivation, self-concept). While the unit of data collection was the individual pupil, the primary unit of analysis was the class. The report presents tables and information concerning two comparisons among class types and three comparisons among the four locations. Findings seemed to favor the small class condition slightly. Supplementary analyses are briefly reported. (RH)

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SOME ANALYSES OF KINDERGARTEN RESULTS IN A STATEWIDE STUDY OF CLASS SIZE: PROJECT ST*R, TENNESSEE, 1985-86*
(DRAFT)

INTRODUCTION

In August, 1987 Project ST*R entered its third year of operation. At this time, the focus of the research was pupils entering second grade. Many of these had entered Project ST*R two years earlier as kindergarten pupils.

In the early fall, 1987 the researchers had received the initial analyses completed by Dr. Jeremy Finn, a research methodologist and consultant to the project from the State University of New York, Buffalo. Dr. Finn conducted a series of analyses using the available kindergarten data for achievement gains (the SESAT-II) and noncognitive measures (SCAMIN). This paper reports the background information and the initial analyses as performed by Dr. Finn for kindergarten (Project year 1985-1986).

Brief Background Sketch

The Tennessee Legislature authorized Project ST*R in May, 1985 and the project began in August, 1985. Representatives from four of Tennessee's Institutions of Higher Education and the State Department of Education joined efforts to conduct and monitor the project. A director was named from the State Department of Education. In the early fall, 1985 42 school districts and 79 individual schools became participants in Project ST*R. The consortium directing the project decided upon a within-school design which provided unusual opportunities and strengths. In this design, each participating school had at least one each of the three class conditions involved in the study. The class condition, a primary variable for analysis, included a small class (S) defined as one teacher with approximately 15 students, a regular class (R) defined as one teacher with

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*These results were compiled by C.M. Achilles, BERS, College of Education, University of Tennessee, Knoxville, TN 37996-3400 from Project ST*R data and primary analyses conducted by Dr. Jeremy Finn, SUNY-Buffalo for Project ST*R.

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approximately 26 students, and a regular class with a teacher aide (RA). The strengths of this design include the fact that each participating school had both the demonstration and the control classes, the design controlled for individual building leadership, district policies, expenditures, etc. Once the districts and schools had been selected (this required voluntary participation), kindergarten pupils were randomly assigned to the three conditions; teachers were randomly assigned to classes. This random assignment produced the "heart" of the four-year ST*R experiment.

SOME FIRST YEAR RESULTS

After the first-year data had been collected, the data were reviewed and edited and entered on a data tape. Since not all pupils took all outcome measures, a research tape was developed so that Professor Finn could complete the primary analyses. This research tape was as complete as possible, but included a slightly fewer number of pupils than those enrolled in the total project. This research tape provided the basis for the primary analyses.

Gross Descriptions of the Data Base

The 1985-86 data base was still being edited (10/87), but portions were ready for basic analyses. The data-base elements (1985-86) are below: S=1:15; R=Regular; RA=Regular with Teacher Aide.

TABLE 1

Parameter of STAR: Totals and Analysis Tape (1985-86)

	Dist.	Sch.	Pupils	Classes (N) (%)							
				S		R		RA		Tot.	
1985-86 (K)	N	N	N	N	%	N	%	N	%	N	%
Unedited Totals	42	79	6495	127	38.7	103	31.4	98	29.9	328	100
Res. Tape (Finn)	42	79	5734	127	38.7	103	31.4	98	29.9	328	100

Except as noted, analyses reported in this section will be from the Finn research tape (n=5734 pupils). Finn divided the pupil data into achievement and non-cognitive measures. The achievement measures were results on the SESAT II* (Math or M, Sounds and Letters of S&L, Words and Sentences or W&S, and Total Reading or TR). The non-cognitive measures were the two SCAMIN subscales (Motivation or Mot. and Self-Concept or SC). The Finn tape included complete data for more pupils for achievement measures (5734) than for non-cognitive measures (4806). Figures 1 and 2 show the basic data parameters for the analyses: Fig. 1 for Achievement; Fig. 2 for Non-cognitive Measures.

The within-school design provided unusual strength for the analysis and there were four general demographic concerns that the legislation required the research to consider. These concerns included the specific location of the project schools in one of four cites: the inner-city, suburban, urban or small city, and rural. Thus, the general design included those four locations and the type of class in a large matrix for either achievement measures (SESAT II) or non-cognitive measures (SCAMIN). The numbers and the units shown in Figures 1 and 2 constitute the primary analysis group.

The unit of data collection for Project ST*R was the individual pupil. The primary unit of analysis, however, was the class (as classified into S, R, RA). This decision reduced the degrees of freedom for the analysis and required larger absolute differences to provide statistical significance. The decision was made because it seems reasonable to expect that a pupil's performance is not an independent measure, but is dependent not only upon the teacher in the class

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*The consortium chose SESAT II over SESAT I for several reasons. Tennessee K objectives correlated better with SESAT II than SESAT I; some comparison schools already used SESAT II, and consortium personnel preferred to have a higher "ceiling," allowing pupils to show greater gain. This resulted in some test-taking frustrations for some pupils and teachers, and some pupils did not achieve well enough on SESAT II to provide a satisfactory baseline.

FIGURES 1 and 2

FILE: Total Sample (Achievement Measures)

LOCATION	SMALL CLASS	LARGE CLASS	LARGE/AIDE CLASS
	TYPE OF CLASS		
INNER CITY	N Schools = 16 N Classes = 26 N Students = 341	N Schools = 16 N Classes = 25 N Students = 494	N Schools = 16 N Classes = 22 N Students = 449
SUBURBAN	N Schools = 18 N Classes = 30 N Students = 396	N Schools = 18 N Classes = 20 N Students = 399	N Schools = 18 N Classes = 22 N Students = 469
URBAN	N Schools = 6 N Classes = 12 N Students = 154	N Schools = 6 N Classes = 7 N Students = 136	N Schools = 6 N Classes = 9 N Students = 178
RURAL	N Schools = 39 N Classes = 59 N Students = 787	N Schools = 39 N Classes = 51 N Students = 1020	N Schools = 39 N Classes = 45 N Students = 911

TOTALS

SMALL CLASS	LARGE CLASS	LARGE/AIDE CLASS	GRAND TOTAL: Achievement Measures
N of Schools = 79 N of Classes = 127 N of Students = 1678	N of Schools = 79 N of Classes = 103 N of Students = 2049	N of Schools = 79 N of Classes = 98 N of Students = 2007	N of Schools = 79 N of Classes = 328 N of Students = 5734

FILE: Total Sample (Non-cognitive Measures)

LOCATION	SMALL CLASS	LARGE CLASS	LARGE/AIDE CLASS
	TYPE OF CLASS		
INNER CITY	N Schools = 15 N Classes = 25 N Students = 281	N Schools = 15 N Classes = 23 N Students = 400	N Schools = 15 N Classes = 21 N Students = 377
SUBURBAN	N Schools = 16 N Classes = 27 N Students = 342	N Schools = 16 N Classes = 18 N Students = 322	N Schools = 16 N Classes = 20 N Students = 395
URBAN	N Schools = 5 N Classes = 10 N Students = 114	N Schools = 5 N Classes = 6 N Students = 99	N Schools = 5 N Classes = 6 N Students = 110
RURAL	N Schools = 37 N Classes = 56 N Students = 704	N Schools = 37 N Classes = 49 N Students = 893	N Schools = 37 N Classes = 42 N Students = 769

SMALL CLASS	LARGE CLASS	LARGE/AIDE CLASS	GRAND TOTAL: Non-cognitive Measures
N of Schools = 73 N of Classes = 118 N of Students = 1441	N of Schools = 73 N of Classes = 96 N of Students = 1714	N of Schools = 73 N of Classes = 89 N of Students = 1651	N of Schools = 73 N of Classes = 303 N of Students = 4806

but also the specific interactions that occur between and among the pupils in a class setting.

PRIMARY ANALYSES

Introduction

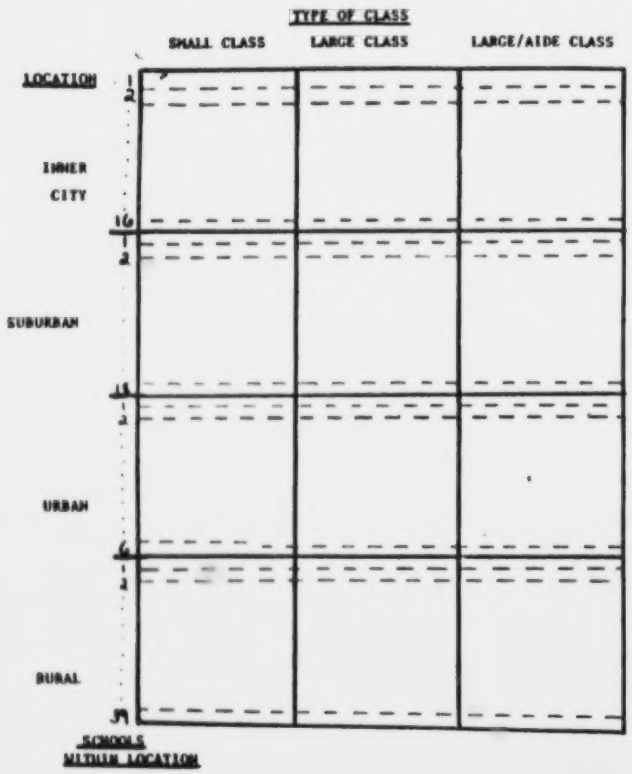
The initial primary analyses used the analysis tape and Dr. Jeremy Finn's multi-variate analysis program. Dr. Finn reported the primary results to the consortium in September, 1987. These "main effects" analyses considered only the required questions as stated in the legislation and were on first-year data only. (Details of Dr. Finn's analyses are available at the ST*R office, Tennessee State Department of Education, Cordell Hull Building, Nashville, TN 37219). The basic outline for the primary "main effects" analysis is in Figure 3.

Variables	Achievement Measures	Non-Cognitive Measures
Class Type S, R, RA		
School Type Urb., Rural, etc.	SESAT II Math (M) Sounds and Letters (SL)	SCAMIN Motivation (Mot.) Self-Concept (SC)
Pupil Vars. Race Sex SES	Words and Sentences (WS) Total Reading (TR)	

FIGURE 3. Display of Principal "Main Effects" Analyses of STAR First-Year (1985-86) Data.

The analysis model grew out of the outline for the primary analysis. The analysis model in Figure 4 shows the grouping or nesting of variables using only the information from Figure 1 for the divisions. Figure 5 shows how this basic analysis model (Figure 4) is modified when specific pupil demographic information is entered into the analysis. Thus, the analysis parameters in Figures 4 and 5 show the framework for analysis of the first-year data. The general model and

FILE: Total Sample

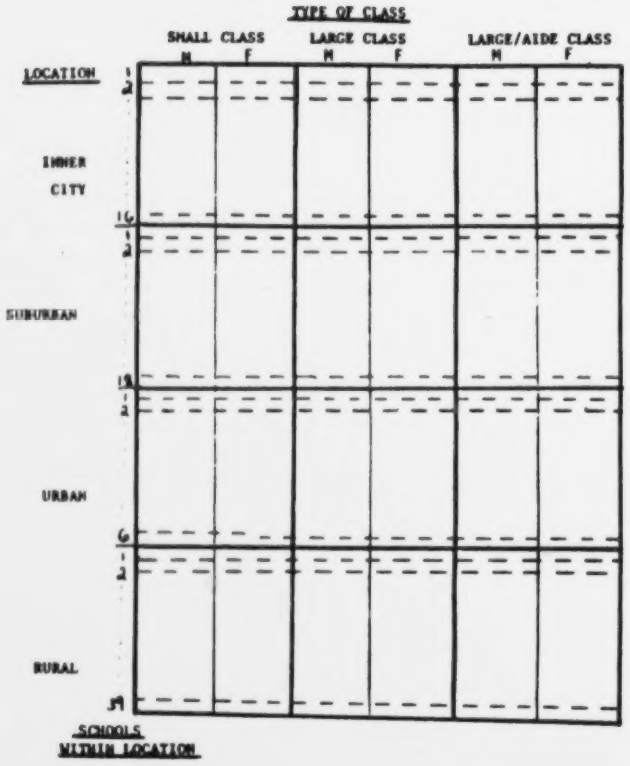


FOR ACHIEVEMENT MEASURES:
Design has 39 schools,
(237 cells and 1 cells empty)
Number of SMALL classes in a school 1-4
Number of LARGE classes in a school 1-3
Number of LARGE/AIDE classes in a school 1-2

FOR NON-COGNITIVE MEASURES:
Design has 33 schools,
(219 cells and 1 cells empty)
Number of SMALL classes in a school 1-4
Number of LARGE classes in a school 1-3
Number of LARGE/AIDE classes in a school 1-2

FIGURE 4

FILE: Male + Females



FOR ACHIEVEMENT MEASURES:
Design has 39 schools,
(237 cells and 1 cells empty)
Number of SMALL classes in a school 1-4
Number of LARGE classes in a school 1-2
Number of LARGE/AIDE classes in a school 1-2

FOR NON-COGNITIVE MEASURES:
Design has 33 schools,
(219 cells and 3 cells empty)
Number of SMALL classes in a school 1-3
Number of LARGE classes in a school 1-3
Number of LARGE/AIDE classes in a school 1-2

FIGURE 5

the notes regarding the design, variations, etc. appear in Figure 6. In Figure 6 (bottom) the two different approaches to the analysis are clearly shown. In the primary model (Figure 4) the analysis consisted of matched t-tests using only the major variables. In the extended model the analysis was a multi-variate approach to accommodate various demographics of interest to the researchers. In the extended model (Figure 5) the statistics were performed on mean difference scores between or among the groups being analyzed.

Sample Design:

4 Locations (urb., rural, etc.)	(Fixed Effect)
Schools nested in Locations	(Random Effect)
Class types (S,R,RA) crossed with locations and school types	(Fixed)
Classes	

Source Table

Source of Variation:	Error Term:	Degrees of freedom (df) Ach. Meas.	Degrees of freedom (df) Noncog. Meas.
Location	Schools	75	69
Type	School x type	149	137
Location x Type	School x Type		
Classes within School-Type Combinations			

Primary Model; Measures:

4 Achievement (Ach):	SESAT II	Matched t tests
2 Noncognitive (Noncog):	SCAMIN	

Extended Model; Measures:

4 Sex (or Race, or SES) Difference Scores on Ach.	Multivariate
2 Sex (or Race, or SES) Difference Scores on Noncog.	Models

FIGURE 6. Analysis Designs: STAR, 1985-86

The analysis employed a general linear model approach for unequal-n design. When the analysis for type (S, R, RA) was found significant ($P \leq .05$) the

location was tested holding type constant. Test statistics were the univariate F - ratio for each measure and Wilk's likelihood ratio for multivariate sets. There were two planned contrasts tested among three class types:

S class mean vs. all R and RA class means

R class mean vs. RA class mean

There were three planned contrasts tested among four locations:

inner-city/urban

suburban/inner-city, urban average

rural/inner-city, urban average

The remainder of this paper presents the tables and information regarding the analysis of these main effects as performed by Dr. Finn. Other presenters will discuss additional analyses, such as teacher exit interviews and other questions. Appendix A includes a listing of all data collection instruments used for Project ST*R in the first year.

Initial Results: Main Effects*

The main scores for STAR pupils on four Achievement measures appear in Table 2, as do the mean class variability scores. Similar data for two Non-Cognitive measures appear in Table 3. Data in both tables show the average scores by location (Urban, Rural, etc.) by the class type (S, R, RA).

Inspection of Table 2 shows that small classes (S) consistently scored higher than R or RA on the achievement measures. On only two of 60 scores were S scores lower than R or RA. The results for non-cognitive (Table 3) are less definite, but the S class averages exceed the R and RA in all but 6 (of 30) reported scores. Thus S classes outscored R and RA 96.7 percent of the time on

*Complete details of all analyses are in a 60+-page report prepared by Dr. Jeremy Finn and available from Project STAR. This report shows all data, mean scores, analyses, etc. Persons interested in the technical details of the analyses should review that report.

TABLE 2

Mean Scores (Rounded) for Achievement Measures and Mean Class Variability Scores: STAR, 1985-86

Class Mean	Math				Sounds/Letters				Words/Sent.				Total Read.			
	S	R	RA	All	S	R	RA	All	S	R	RA	All	S	R	RA	All
Inner C.	474.3	470.6	470.6	471.9	432.5	424.1	435.3	430.5	431.4	424.6	429.0	428.4	431.8	424.4	431.1	429.1
Suburb.	491.7	494.9	487.0	491.1	454.2	451.9	445.3	450.8	443.2	435.3	433.9	438.2	447.6	441.0	438.6	443.0
Urban	495.3	482.3	479.3	486.9	459.3	455.4	447.9	454.7	444.1	440.6	437.7	441.1	449.0	445.5	441.5	445.7
Rural	492.3	482.2	484.8	486.8	445.1	438.4	439.4	441.2	437.7	434.8	435.0	436.0	440.6	436.3	436.7	438.0
Tot.	488.8	481.9	481.6	-	446.0	438.7	440.6	-	438.3	432.8	433.7	-	441.2	435.0	436.3	-
Class Var.																
Inner C.	3.45	3.37	3.20	NA	3.30	3.21	3.08	NA	2.63	2.59	2.61	NA	2.81	2.73	2.70	NA
Suburb.	3.51	3.45	3.43	NA	3.29	3.32	3.26	NA	2.89	2.90	2.87	NA	2.95	2.96	2.92	NA
Urban	3.38	3.57	3.50	NA	3.24	3.28	3.22	NA	2.87	2.97	2.92	NA	2.89	3.01	2.95	NA
Rural	3.44	3.44	3.42	NA	3.25	3.30	3.27	NA	2.87	2.82	2.91	NA	2.93	2.93	2.95	NA
Tot.	3.45	3.43	3.38	NA	3.27	3.28	3.22	NA	2.82	2.79	2.84	NA	2.91	2.89	2.89	NA

TABLE 3

Mean Scores (Rounded) for Non-Cognitive Measures and Mean Class Variability Scores: STAR, 1985-86

Class Mean	Motivation			Self-Concept		
	S	R	RA	S	R	RA
Inner C.	25.99	25.96	25.45	31.28	30.12	30.09
Suburban	25.48	25.40	25.64	30.39	30.07	30.29
Urban	25.58	25.67	25.65	31.02	29.85	30.39
Rural	25.66	25.67	25.69	30.60	30.17	30.10
Tot.	25.68	25.69	25.62	30.73	30.12	30.16
Class Var.						
Inner C.	.88	.79	.83	1.07	1.11	1.10
Suburban	.70	.69	.69	1.02	1.07	1.08
Urban	.81	.81	.81	1.01	1.13	1.09
Rural	.65	.71	.75	.96	1.08	1.08
Tot.	.72	.73	.76	1.00	1.09	1.08

achievement and 80.0 percent of the time on non-cognitive measures when considering only class average scores.

Table 4 contains the principal main effects (class type) analysis for the 1985-86 results on achievement (SESAT II) and non-cognitive (SCAMIN) results for kindergarten (K) classes. Table 4 shows actual significance levels (for all $p \leq .05$) of the analyses, with explanatory notes as appropriate. In summary, smaller classes (S) have higher achievement scores and higher self-concept (non-cognitive) results than R and RA. There are also differences by location, but these disappear when the analysis is controlled for SES. That is, SES "explains" the differences by location. Analyses and inspection of mean scores (Table 2) indicate no differences between R and RA classes.

Summary of Analyses

Detailed analyses of STAR data included study of the possible variable impact of class type (S, R, RA) on pupils of different races or sex. These analyses followed the same basic format described previously.

Sex Differences. Females outperform males on K results on all achievement measures over all classes (.05). The differences are most pronounced in urban schools in reading and in inner city in math. There is no interaction of sex vs. class type; small classes on the average are superior to R and RA for both boys and girls. There are no sex differences on non-cognitive measures, and the higher average non-cognitive scores found in S are equally true for both sexes. Males are more variable than females (females are more homogeneous) in their non-cognitive measures.

Race Differences. On average, white students in K outperform non-white pupils on all achievement measures. These differences are not explained by SES. There are no race differences in the non-cognitive measures. Non-white pupils are more homogeneous (less variability) than white pupils on all four achieve-

TABLE 4

Results of Tests of Significance for Differences in Class Means and Variability on Achievement and Non-Cognitive Measures by Class Type and Location: STAR, 1985-86

		Achievement Measures					Non-Cognitive Meas.		
		Math	S&L	W&S	Tot R	All	Mot.	Self-C.	All
Locations	Class x	.05	.01	.08	.02	.01(A)	NS	NS	NS
	Cont. for SES	NS	NS	NS	NS	.05(B)	NS	NS	NS
	Variability	NS	NS	.01(C)	.05	NS	.01(D)	NS	.05
Types	Class x	.02	.02	.001	.001	.05(E)	NS	.01(F)	.05
	Cont. for SES	.02	.01	.001	.001	.05	NS	.01	.05
	Variability	NS	NS	NS	NS	NS	NS	.02(G)	.06
Types x Locations	Class x	NS	NS	NS	NS	NS(H)	NS	NS	NS
	Cont. for SES	NS	NS	NS	NS	NS	NS	NS	NS
	Variability	NS	NS	NS	NS	NS	NS	NS	NS

S&L=Sounds and Letters; W&S=Words and Sentences; Tot R=Total Reading; NS=Not Signif.

(A) For all measures, urban > inner city, esp. reading: inner city has lowest mean, followed by rural, suburb. and urban (see "All," Table III-5).
(B) All indiv. effects are NS when controlled for SES. SES "explains" regional differences.
(C) Inner city less variable than all others. See Means, Table III-5.
(D) Rural and suburban much less variable than urban and inner city.
(E) Small classes significantly better than others on all measures. No diff. between R and RA. This is true when controlling for SES.
(F) Small classes higher x Self-C. than others in all locations. No difference in motivation.
(G) Small classes less variable than R and RA, also higher Self-C.
(H) No interaction, type x Location. S are significantly better to same extent in all locations.

ment measures (math, S&L, W&S, Tot. R), but they also are consistently lower on these measures.

Single-Race Analyses. A single-race class was defined as a class that had a preponderance of one race with no more than two of another race. There were not enough of these types of conditions to do a complete analysis: race x location and class type x race x location interactions could not be tested. On achievement measures, rural (predominately white) schools outperformed inner city (predominately non-white) schools, and there was a trend (.06) of larger white-non-white differences in R classes than in S classes on the Sounds and Letters measure of the SESAT-II. There were no differences between these two groups of classes on non-cognitive measures.

Other Analyses: Benefits and Associations

Using only the K (1985-86) data, some analyses attempted to determine if there were benefits to the S classes in terms of numbers of classes benefitting relative to the degree of the benefit. The analyses employed a "small-class advantage score" determined by calculating difference scores for each small class on each measure by subtracting the small class mean from the large class mean. The following categories helped define the small class benefit: a big benefit was 2 standard errors on each test; some benefit was a positive gain on each test; mixed was some gain on some tests; no benefit was no advantage to S on any test. These results are summarized in Table 5. Note that on achievement measures S benefitted 39.4 percent, mixed (34.6 percent) and had no benefit 26.0 percent. On non-cognitive measures, the results, respectively, were 39.8, 34.7, and 25.4 percent. Thus, at K, using only one year of data, there are modest benefits to the small classes overall. These benefits varied by location, with the inner-city small classes having the greatest big benefit (52 percent) and rural schools having the least (26.8 percent).

TABLE 5

Benefits to Small Classes on Achievement and Non-Cognitive Measures: STAR (1985-86)

		(Big Benefit) 2 Std. Err. on Ea. Test	(Some Benefit) on Ea. Test	Mixed	No Benefit on Any Test
Achievement Tests (n=4)	Classes (n=127)	41 (32.3%)	9 (7.1%)	44 (34.6%)	33 (26.0%)
	Schools* (n=79)	39 (49.4%)		40	(50.6)
Non-Cog. Measures (n=2)	Classes (n=118)	40 (33.9%)	7 (5.9%)	41 (34.7%)	30 (25.4%)
	Schools* (n=73)	37 (50.7)		36	(49.3)

*This is just the number of different schools in which these classes are found; not all small classes in these schools may have benefitted as shown.

A second procedure to determine the extent of the S advantage over the R and RA was to convert mean scores to raw scores (and then to determine scaled scores) and to grade equivalents (GE), which are fairly commonly understood by the general public. In general, the advantage to small classes over R and RA on the four achievement measures is about 1 month/year (.1 GE), and the advantage on self-concept is just over one-third of a standard deviation. These results appear in Table 6. Results in Tables 5 and 6 suggest that teacher effect is important; good teachers get good results regardless of class size. If true, the issue still remains to be solved: do good teachers get better results in small classes (1:15) than in regular classes (1:25)?

Further analyses attempted to determine if certain factors could be associated with highly effective small classes. Highly effective small classes were those that had a two standard error advantage over large classes in the same school on every one (of four) achievement and/or on both non-cognitive measures. "Ineffective" small classes performed more poorly than R classes in the same schools on all four achievement and/or both non-cognitive measures respectively.

On four measures (teacher years' experience, teacher highest degree, percent minority and proportion free lunch or SES) there were no patterned (significant) differences between the highly effective and highly ineffective small classes on achievement and non-cognitive measures ($p \leq .05$).

Classes effective in teaching achievement measures are not necessarily effective in achieving positive non-cognitive results ($x^2=11.71$, $p \leq .05$, df2). There are positive ($p \leq .05$) relationships between each of the achievement measures and self-concept, but not with the non-cognitive measures of motivation.

Other Analyses

Project personnel conducted additional analyses, both on the achievement and noncognitive measures described previously and on other data sources. Data were collected from teachers on Cruickshank's "Teacher Problems Inventory" or

TABLE 6

Computation of Extent of Small-Class Advantage Over Regular (R) and Regular with Aide (RA) Classes: Project STAR, 1985-86, Total Sample

Measures	Small-Class Advantage Over...			
	Regular		Reg. with Aide	
	Scaled Score	Grade Eq.	Scaled Score	Grade Eq.
Math	6.9	<.1	7.2	<.1
Sounds/Letters	7.3	<.1	5.4	0.0
Words/Sent.	5.5	.1	4.7	.1
Tot. Read.	6.2	.1	4.9	.1
Self Concept	.61	.39*	.57	.37*

*Standard deviations

TPI, parent-teacher interactions, exit interviews. Data were also collected on pupil attendance and other variables.

Teacher Classroom Problems. The TPI, completed by most STAR teachers, covers five teacher concerns.

1. Affiliation - The need to establish effective relations with others in the school (8 items).
2. Control - The need to have students behave appropriately (12 items).
3. Parent Relationships - The need to work well with parents in the education of their children (8 items).
4. Student Success - The need to have students do well (24 items).
5. Time - The need to be effective managers of time (8 times).

For each item, teachers indicate how often the problem occurs (frequency) and how much of a problem it is (bothersome). A higher item score indicates that the item is less often a problem and is less bothersome, and a lower score indicates that it is a problem. Table 7 shows that in all situations the average scores of S teachers are higher than for R or RA, showing a trend that S teachers have fewer problems than R and RA teachers, and these problems are less bothersome. A preliminary analysis of data for 76 East Tennessee teachers

TABLE 7

Responses to Teacher Problem Checklist by Class Type
Project STAR, 1985-86 (N=76)

Problem Area	Conditions* S (n=23)		R (n=20)		RA (n=33)	
	Freq.	Bother	Freq.	Bother	Freq.	Bother
Use of Time	27.6**	30.2	23.8**	26.7	23.6**	25.3
Student Success	59.6	72.8	55.2	64.9	56.6	65.7
Parent Rel.	19.2	23.4	18.1	20.0	19.0	21.4
Control	31.5	40.6	29.6	36.2	29.7	36.2
Affiliation	15.8	18.8	14.7	16.7	15.4	17.1

*This analysis was performed on a subsample of 76 teachers.
**Differences between S and R and S and RA were significant (.05).

indicates that small class (S) teachers report significantly (.05) fewer problems in their use of time than do teachers in R and RA conditions, and that the other responses, although favoring the S condition, are not significant.

Attendance and Class Size. Attendance data were collected on all students and compared. The students in S had about the same attendance records as students in R and RA conditions.

Some Discussion

The first-year ST*R results seemed to favor the small class(s) condition slightly. Differences do seem to be more related to classes (that is, probably teacher effectiveness or teacher ability), than to class size, although it is still too soon to be definitive about this. The small class condition gains substantial benefit approximately half of the time, and the results are either mixed or in favor of other conditions the rest of the time.

Part of the problem could be with the achievement measure as the SESAT-II may have been a bit rigorous for kindergarten youngsters. The data have not yet been analyzed for a series of "comparison" schools chosen to provide general parameters for the ST*R project. Perhaps when these data have been analyzed and results compared to the various class conditions in ST*R, answers will be more definitive.

The things which makes the ST*R project different from many other studies on class size is its longitudinal nature, within-school design and randomness. Thus, researchers believe that clearer answers will be provided when second and subsequent years of data are available for analysis.

The ST*R project was to address not only what (if any) differences were evident among the class sizes, but also to attempt to explain why such differences would occur. To answer the second portion of this question, many ancillary studies have been initiated. One is a pilot test of teacher behaviors in kindergarten. A second is the insertion of training as part of the model and

planned analyses of teacher behaviors before and after training in the various class conditions. Other analyses will include careful inspection of classes which had unusual positive gain (S, R, RA). Given the four-year nature of this study and the magnitude of data being collected, the researchers believe that, given maintenance of the unusually rigorous design, the project should provide solid answers to the long-standing question of class-size and pupil achievement. Additionally, because of the ancillary studies available, researchers hope to explore the variable of class size as it relates to other variables (such as teacher attitude and teacher problems). The project is more complete than many prior class-size projects in that it is reviewing not only academic achievement, but also non-cognitive measures, teacher information, and many other factors.

DATA COLLECTION INSTRUMENTS

1. Profiles: Data collected include:

   System: Enrollment, total expenditures per student, location.

   School: Type, size, type of community served, special school programs that affect the learning environment.

   Principal: Characteristics including age, sex, race, education, experience, etc.

   Teacher: Characteristics including age, sex, race, education, certification, experience, career ladder level, attendance, etc.

   Aide: Characteristics including age, sex, race, education, experience as an aide.

   Project Student: Characteristics including age, sex, race, socio-economic status, special education programs.

   Comparison Student: Characteristics including age, sex, race, and socio-economic status.

2. Stanford Early School Achievement Test (Form II)
   Data collected measure pupil achievement in math and reading/language arts, based on national norms.

3. Self-Concept and Motivation Inventory (SCAMIN)
   Data collected measure elements of academic self-concept and academic motivation.

4. Basic Skills Mastery
   Data collected measure the mastery level of reading/language arts and math objectives taught using the BSF program. A criterion referenced test will be used to measure mastery of objectives in grades 1, 2, and 3.

5. Grouping Questionnaire
   Data collected measure the extent to which teachers regularly divide students into groups for instruction.

6. Parent/Teacher Interaction Questionnaire
   Data collected measure the amount of time teachers spend interacting with parents for a week, during a month and during a school year.

7. Teacher/Problem Checklist (Cruickshank)
   Data collected measure teacher perceived problems related to class size and pupil/teacher ratio.

8. Teacher Log
   Data collected measure a self-reported use of school time

9. Aide Log
   Data colected measure a self-reported use of school time

10. Aide Questionnaire
    Data collected measure basic information as to aides' supervision, job description and training.

11. Exit Interviews
    Data collected measure teacher perceptions pertinent to the project.